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FOUNDRY TRADE JOURNAL
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Vol. 69 Thursday, March 18, 1943 No. 1387

Concentration of Foundries Abandoned

An authoritative announcement has now been made that the concentration of the ironfoundry industry is to proceed no further. This satisfactory outcome is solely due to the efforts which have been made on behalf of the industry by the Council of Ironfoundry Associations. The various meetings which they organised throughout the country provided convincing evidence that further action directed towards concentration would impede rather than aid the war effort. Despite this outcome of co-operative action, every foundry owner must bear in mind the motives of the Board of Trade when they originated this movement, because their urgency still remains. These motives included (1) the employment of skilled men on work where their training and experience will best help the war effort; (2) the reduction in man-hours consumed in transporting materials to foundries; and (3) increased output using ever-decreasing man-hours. These factors, coupled with the necessity of using more women in industry, are still pressing problems and constitute the "Order of the day" for the officers of the industrial army.

Now that the situation is stabilised, it is desirable to examine in some detail just what has happened, and why. The C.F.A. came into being through the co-operative action of foundry employers' associations throughout the country. Each association elected representatives to serve on a Council, which, by its very constitution, must speak authoritatively for the whole industry. There is no disguising the fact that those elected were drawn from the larger concerns, but it should be borne in mind that 80 to 90 per cent. of the production of iron castings is made by 10 per cent. of the foundries. It would not be illogical to state that the impact of a thorough-going concentration upon such firms would be nothing more serious than a temporary but profound nuisance. For the smaller firms in the industry, it would certainly involve the dispersal of their staff, and tiresome negotiations with their customers. Yet throughout the protracted negotiations, two principles only animated the activities of the C.F.A.—the creation of conditions for the exercise of the maximum war effort and the interests of the *whole* of the ironfoundry industry. As a result there must be many owners of smaller concerns, who must feel very much easier in mind, now that there is a reasonable assurance that they can concentrate their efforts on war production rather than on the impact of "concentration." Much of the income of our large voluntary hospitals comes from patients by way of thank offerings for the treatment they have received and as an insurance that the institutions will still be in being should there be need to call upon their services. It is in his own interests as well as for the good of the industry as a whole that every ironfoundry owner, be his concern large or small, should join his appropriate employers' association, a list of which is printed earlier in the JOURNAL.

The vigilance now being exercised will be just as necessary, and probably even more so, on the cessation of hostilities, as it is likely that Government control will continue for some years to come. The problems to be solved are already having the careful consideration of the C.F.A. and we shall outline these in the near future. In the meantime our congratulations to the President, Mr. Fitz-Herbert Wright, and his hard-working colleagues will be shared by all branches of the ironfoundry industry.

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CORRESPONDENCE

[We accept no responsibility for the statements made or the opinions expressed by our correspondents.]

WHY A DRAWBACK WAS USED

To the Editor of THE FOUNDRY TRADE JOURNAL.

SIR,—I have read with interest the two letters on my article, "Why a Drawback Was Used," one of which came from the pen of Mr. Smith and the other from Mr. Gale. Mr. Smith's method seems to me to be rather complicated, involving too many operations for the setting of so simple a core. In the first place, two grids would have to be made, one for each half of the core and then again it would be necessary to call in the patternmaker for alterations to the corebox.

Mr. Gale's method of using a grid, of course, is good practice and one that I have employed many times in the making of large bedplates, but a grid is not possible with this design of pattern, as it is boxed in at the section under discussion, hence the use of a dry-sand core. As pointed out in the article with the drawback lifted away, the mould is quite easy to tool and finish, a distinct advantage under black-out conditions. Mr. Gale's reference to a possible scrap casting due to sand and dirt in the setting of such large cores is hard to imagine, as one can inspect both the core and mould before replacing the drawback and only carelessness would bring about such a mishap.—Yours, etc.,

"W.G."

Preston.
February 24, 1943.

HUMIDITY AND CUPOLA PRACTICE

To the Editor of THE FOUNDRY TRADE JOURNAL.

SIR,—May I encroach upon your valuable space to inquire whether any reader can give me real facts concerning the effect of humidity of the air blown into a cupola? As far as I can estimate, the difference between saturated and dry air oxygen content is so small as to be almost negligible, and I believe this opinion was supported in the excellent Paper read at last year's London conference.

However, some people tell me that humid air makes a considerable difference to cupola practice, and it is to these readers that I beg to appeal for guidance. It seems reasonable to expect that wet coke would have far more effect than damp air, and also that closer observation of the barometer pressure might account for apparent discrepancies. A change of 1 in. in the barometer accounts for nearly 2 per cent. in the oxygen content, whereas, as far as I can see, the difference at normal temperatures between fully saturated air and dry air (which we very rarely experience) is about 1 per cent.

Yours, etc.,
H. A. HALLETT,
Managing Director.

Metronic Instrument Company, Limited,
196, Grove Lane, Smethwick, 40, Staffs.
March 5, 1943.

RECLAMATION OF POROUS CASTINGS

To the Editor of THE FOUNDRY TRADE JOURNAL.

SIR,—In preference to filling up holes with weak cements, spot welding is the better method. It is more reliable, and the strength of the weld compares very favourably with the strength of the casting. I would suggest, however, that when founders are doing any filling up, or find it necessary to do any, because of the particular problems of manufacturing specific castings, that they have the permission of the purchasers or their representatives.

It is creditable to engineers that so far I have never found them sceptical in their views of our problems, and in this particular matter it is felt better that we always give them our confidence.

The engineers have their problems, too, and more mutual trust will go far in creating better co-ordination between us.—Yours, etc.,

W. T. BRUCE,
Works Manager, Sand Spun Pipe Plant,
The Staveley Coal & Iron Company, Limited.
March 6, 1943.

PLASTICS v. METALS

That plastics and metals will not be competitors after the war, but will aid each other, is the view of Dr. Allan Bates, of the Westinghouse Research Laboratories. Both materials had inherent advantages and disadvantages that bar any complete replacement of the other, he considered. Actually more metals would be used in the future because their partnership with plastics would make possible many new products. In some instances, of course, the two would be rivals, but they would work more and more together in vastly improved airplanes, motor cars, electric generators and motors and thousands of other industrial products.

Some partisans said plastics and synthetic resins eventually would be used for everything except food. But there were innumerable articles that would be metal for years to come—motor-car crankshafts and valves, electric transmission lines, blast furnaces and electric motor armatures are examples. Plastics burn or melt at temperatures that have little effect on most metals. And plastics are not useful as conductors of electricity. It can thus be safely predicted that they would not replace metals in the many uses which require conductivity and stability at high temperatures.

The low-cost era of plastics has not yet arrived, he said, and economic considerations still give metals an advantage in many applications. Costs of various plastics are from 20 cents to $1 a pound, while steel can be produced at a cost of several cents a pound, aluminium at 15 cents and copper at 12 cents.

The production of seamless steel tubes and welded steel tubes in Germany has now been limited to a small number of approved manufacturers, which have been allocated fixed production quotas. Dimensions have been standardised and only these standards can henceforth be made.

FOUNDRY TECHNIQUE IN RELATION TO CERTAIN PRESSURE CASTINGS*

Describing the production of characteristic types of castings from the practical standpoint

By F. DUNLEAVY

This Paper is simply a description of methods of making certain castings. The author does not claim that the practice is new or that it is the only way of producing these types of castings, but it is an account of the author's foundry practice, with a few selected examples showing some of his difficulties.

Small Grey-Iron Impellers

In the production of small, grey-iron impellers, the usual causes of rejection are misruns, drawn-in bore, blowholes on shroud, unequal thickness of top and bottom shrouds. The latter defect is more noticeable when the impellers are machined down to a smaller diameter. These troubles occur much more

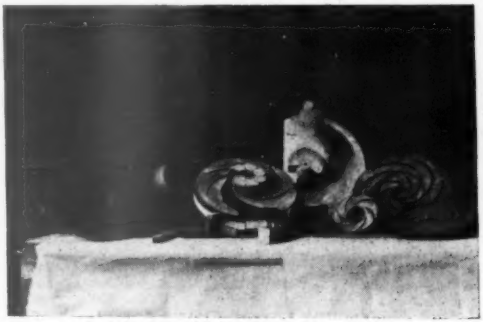


FIG. 1.—SMALL IMPELLER CORES.

frequently in grey iron than non-ferrous alloys. The probable explanation is the fact that in pouring, temperatures are increased from around 1,150 deg. C. for non-ferrous alloys to around 1,300 deg. C. for grey iron, thereby causing a more rapid expansion of the core and greater volume of mould gases.

Misruns.—Misruns are mainly dependent upon ingates in relation to section of casting, temperature of metal and metal composition. Consideration of these factors can do much to eliminate this trouble. To obtain correct temperature and composition for the thinner types of impeller, melting is carried out in an 18-in. diameter cupolette. The use of this small melting unit ensured the metal being free from contamination by other charges and solved the machining problem of the shroud tips occasionally being white.

* Paper read before the Lancashire Branch of the Institute of British Foundrymen.

Draws.—The iron used must be soft enough for the thin section, thus draws in the bores are due to the much greater thickness compared with shroud. To eliminate the draw the bores of these impellers are now chilled with either mild-steel or grey-iron chills in place of the straight centre core. When these castings are made in non-ferrous alloys, the centre boss is cast solid and run directly through this portion of the casting.

Blowholes.—Blowholes from a green-sand mould can usually be attributed to wet sand or sand rammed too hard, the inevitable result being that the mould gases tending to take the line of least resistance, which is upwards through the metal, cannot get away quickly enough, due to the quick cooling rate of the shroud. Facing sand with a low permeability will give similar results.

FIG. 2.—RANGE OF SMALL CAST-IRON IMPELLERS.

Blowholes from dry-sand moulds are due mainly to insufficient drying and a low permeability sand. The results are very similar to those in green-sand moulds. Blowholes from the core are caused mainly through the cores being improperly baked and incorrect venting. Venting of the smaller and thinner types of impellers is only effected by puncturing the skin of the core on the top of the print of the centre boss.

Small impeller cores such as are shown in Fig. 1 are made in a specially prepared sea sand with a linseed oil base and 6 per cent. moisture added by a standard measure. In the making of these small impeller cores, the sand is packed into the corebox with the fingers. Where necessary, wires are worked into the centre of the sand. The core is then again packed by the fingers to the top of the box and the centre boss swept out by means of a strickle worked from a centre spindle fixed into the corebox. If the corebox is made with the boss upwards, after the core has been made, a wooden frame which is

Founding of Pressure Castings

slightly deeper than the centre boss is placed on to the corebox. This is rammed with wet sea sand and the whole assembly turned over on to a plate. Corebox and frame are drawn off and the core then stands upon a plate of wet sea sand, this being the only type of carrier used. When new boxes are being made or old ones being replaced, an attempt is made to make these cores with the bosses downwards to eliminate the wet sand packing and reduce the chances of distortion of the cores.

In the past it was suspected that blowholes were due to cores not being sufficiently dried, and to correct this each core was placed on to a brazier or open fire and burned slightly or until the bottom side of the core had turned to a dark colour, but this practice was only moderately successful. A thorough investigation revealed that the blowholes were mainly due to the core gases being obstructed in their exit from around the centre boss. Vents along the vanes were not so important as at first thought.

The present practice is to make sure of the baking and to break the skin of the core with a wire or sprig on the top of the boss on opposite sides from the runner and riser. A touch between the top box and top of core is essential to release the gases through the top box from the heaviest body of sand. Experience has proved this method to be successful in eliminating blowholes from the cores.

Fig. 2 shows a group of several types of grey-iron impellers. On the left are three castings that have been machined down to a smaller diameter and the parted-off rings. When the rings were cut off, the impellers were found to be unserviceable, as the top shrouds were too thin owing to the cores having warped during pouring; very often the introduction of more ingates of smaller diameter allowing the metal to enter the mould over a larger area prevented this warping of the core. In extreme cases it was found

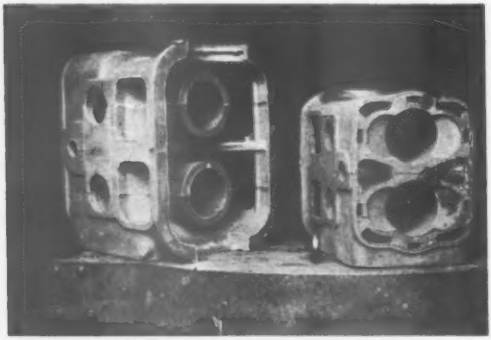


FIG. 3.—COMBINED AIR-COMPRESSOR CYLINDER AND CRANKCASE.

FIG. 4.—ILLUSTRATES THE ORIGINAL METHOD OF MAKING THE CASTING SHOWN IN FIG. 3.

FIG. 5.—MOULD READY FOR CLOSING.

FIG. 6.—THREE SETS OF PUMP CASINGS.

necessary to use stronger flattened wire to achieve the same object.

Fig. 2 also shows one method of overcoming the hard tips on the edge of the shroud. A thickened rim of metal is cast all round the outside edge and later removed during the machining operations. A typical final analysis for these castings is:—T.C, 3.3; Si, 2.6; Mn, 0.6; S, 0.10; and P, 1.0 per cent.

Combined Air Compressor Cylinder and Crankcase

Fig. 3 shows two sizes, 1,250 lbs. and 660 lbs. respectively, of a combined air compressor cylinder and crankcase. The design is identical in each case; only the dimensions vary. Inspection of these castings is particularly thorough, and slight defects in the bore, or on the outside around the water jacket, or failure on hydraulic test of 200 lbs. per sq. in., cause rejection. Due to the number of rejected castings, the original method of manufacture had to be altered.

Fig. 4 shows the former method of moulding and casting and illustrates a complete set of cores and the bottom half-box, tilted to show the inside of the mould, with the downgate on the right. The bottom inlet to the mould enters at the bottom flange and not on this joint face. Two top runners fit into the cylinder bores, and provision was made for them by cutting away part of the box ends. This box is two parted, rammed up by a Sandslinger, and dried in the stove. The box size is 5 ft. 10 in. by 4 ft. 6 in. by 2 ft. 3 in.

Special care must be taken with the cores for these castings, and the assembling in the mould constitutes quite a problem. The centres of the cylinder bores must be accurate; also, the mould thickness around the jackets must be correct. Badly made or distorted cores will throw out the centres and cause endless trouble during the coring-up process.

Fig. 5 shows the completely cored mould ready for

FIG. 7.—PRESENT METHOD OF MAKING PUMP CASINGS.

FIG. 8.—SHOWING THE MOULD READY FOR CASTING.

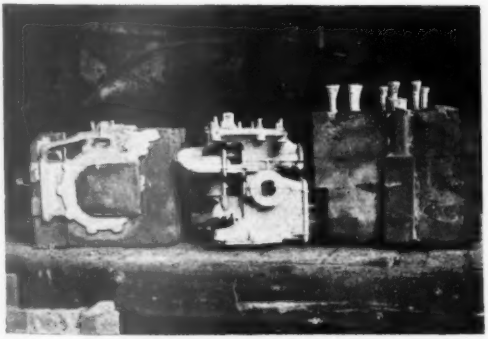


FIG. 9.—PUMP CASTINGS, BEFORE AND AFTER STRIPPING.

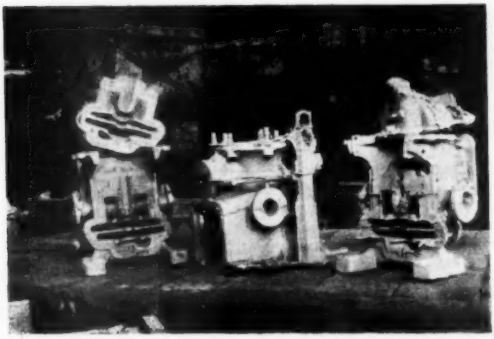


FIG. 10.—SHOWS A GROUP OF CASTINGS. ONE READY FOR MACHINING AND TWO UNFETTLED.

Founding of Pressure Castings

final closing. The vents at the top of the cylinder bores were made up with sand, in order to ensure that no metal enters, and led off through the side of the box when it is in position for casting. All the cores for these castings were made in sea sand with an oil binder, and great care was taken to make certain that the air had an easy exit to atmosphere. Jacket cores were vented by breaking the skin at the prints in several places. When the mould was being closed, the top moulding box was set to marks and pins to ensure a correct register. The whole assembly was bolted up and turned on end to cast. A cushion of metal was assured before the two top runner plugs were lifted.

This practice was followed for a long time with varying success. The moulds were poured as hot as possible in order to keep the bores clean. The ladle was taken from under the spout, skimmed

FIG. 11.—SHOWS A SET OF CORES FOR A COMPOSITE CASING.

off, taken straight to the mould; even then a very small patch of sand was sometimes found in one bore sufficient to scrap the casting. Very often it appeared to be a very small patch of open metal, until the casting was broken up, when the sand theory was upheld. On investigation it was found that the fluid metal was scouring the top jacket core, which is shown in this view.

Compared with the old, the present method of casting is far more satisfactory. There has been a slight alteration in design, permitting the moulds to be cast in the same position as they are cored up, and changes in the method of running. The new design allowed two core prints on the jacket cores at the opposite end to the end core prints on the top face of the mould, thus easing the venting problem. The new method of running is as follows: The bottom moulding box is rammed with two ¾-in. down runners set into position on a board, and the mould rammed to the top of this half pattern. Down the length of one side of the pattern, the mould is sleeked off and the inlet cores placed in correct position, one of these cores having two inlets and one in the other. The mould is now completely rammed, and the ¾-in. down runner through the top box is connected to the two down runners to the bottom of the mould by a channel cut on the mould joint to break the flow of the metal.

The slight modification to the design ensured the release of the expanded core gases from the jacket core in a natural upwards direction, and the slower running of the metal by entering the mould over a larger area certainly appears to be the solution to a very large extent. A typical analysis of these castings is:—T.C, 3.2 to 3.3; Si, 1.4 to 1.6; Mn, 0.6 to 0.7; S, 0.11, and P, 0.4 per cent.

Pump Casings

Fig. 6 shows three sets of castings, from different

FIG. 12.—SHOWS THE CORE ASSEMBLY.

angles, of rather intricate pump bodies. A close inspection of this view will convince one that the designs of these castings are such that they would be a very difficult problem to make in the normal way by having a separate pattern and coreboxes for the top and bottom half casings. Loose bosses and drawback cores would be too numerous, with the inevitable result of bosses out of position and the possibility of wrong cores being placed in the wrong prints, plus the numerous joint marks that are impossible to grind out satisfactorily.

Bearing these points in mind, the decision was made to block out the whole job and make it in cores. A block pattern was made the full size of the job and rammed up by the usual foundry method and dried in the stove. The cores were fitted in to the mould, and it was found a rather difficult operation to set the cores correctly over the moulding box. This box was 3 ft. square, 3 ft. high, and as the

metal thickness of the body is only ¼ in., if the core joints are not matched accurately the casting is a waster before it leaves the foundry.

Another fault with the block pattern principle was the question of taper in the coreboxes. All the boxes must be tapered the same way and fit correctly together, otherwise the resultant castings would be twisted out of truth. During the setting of these cores in the mould the difference between the pattern and coreboxes due to rapping became very noticeable on the core joints in the mould, and in some cases there was considerable clearance between the mould and the core.

The block pattern method was discarded in favour of the one shown in Fig. 7. The only piece of pattern now used is shown in the right-hand foreground. This is a forming piece for the bottom part of the assembly, and is the only piece of mould now used for this type of casting. The mould is shown tilted in the background. The three ingates are clearly shown on this mould portion, and have been fixed

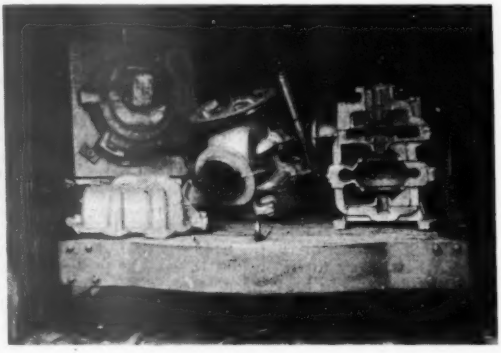


FIG. 13.—PATTERN AND CASTING OF A FURTHER TYPE OF PUMP CASING.

permanently on the pattern, and the inlets on the joints are all fixed into the coreboxes. All the cores are made in oil sand. Those forming the interior are in the centre of the view and the outside wall cores are on the right. The boxes for the outside wall are now held together during ramming with bolts and wing nuts and are taken apart instead of drawing the box off the core, thus avoiding taper, which is undesirable.

When the moulder receives these cores, they have already been matched up and marked by the coremaker to guide the moulder who works to those marks whilst building. It will be noted that the second core from the bottom has been split to enable the moulder to pass this core around the air vessel branch, which is an obstruction against a straight drop on, and to enable this particular spot to be checked for thickness.

When the whole set of cores is assembled, loose frames are placed on the bottom moulding box to surround the job. These frames are rammed up with floor sand to stop the cores from moving out of position. The whole assembly is bolted down to the bottom box; the top core is wedged to the straps to retard any upward strain and the runner box and risers are placed into position. Fig. 8 shows the completed job ready for casting.

Fig. 9 shows three castings, two in blocks before core removal, and the one in the centre having had the core removed and sand-blasted, but the top part of the casting still requires parting from the bottom. The block on the left is a view of the bottom of the casting showing the three inlets. The one on the right shows the method of making the down-runner. This is also made in oil sand and laid up to the outside core wall and directly over the inlets. The joints are made up with stiff loam. The down-runner is 2¼ in. wide and 1¼ in. deep. One advantage of this system is that the same method of running and feeding is used whether the material is either ferrous or non-ferrous. This practice is standard for this type of casting and is perfectly satisfactory in both metals.

Fig. 10 shows three sets of the same castings from another angle. The total dressed weight is 324 lbs., the bottom half being 254 lbs. and the top half 70 lbs. The castings are subjected to 160 lbs. per sq. in. hydraulic pressure. Fig. 11 shows a set of cores for a similar type of grey iron combined top and bottom half casing. The standard runner cores are also to be seen in this view. The intricate design will be appreciated.

Fig. 12 shows the same set of cores partly assembled. The marked joints will be noticed. These marks facilitate the work of the moulder very much, although care must still be taken when building, particularly to the matching of the inside and outside cores for thickness. Fig. 13 shows another type of grey-iron pump casing made by the same method. The pattern is shown in the background. The casting in the centre has had the outside core removed, but still requires parting. The top half casting matches with the bottom half shown on the right.

(To be continued.)

Although steel plants in Axis Europe can probably obtain adequate tonnages of iron ore and coal for their operations, supplies of alloy materials to make the precision alloy steels of modern warfare may be difficult to maintain in the face of intensified bomb damage to plants and transport facilities, concludes the American Iron and Steel Institute. It is estimated that Germany has available in Continental Europe only about one-third of the manganese, less than half of the chromium and only 10 per cent. of the nickel needed to keep pace with the United States in producing alloy steels. None of the countries of Continental Europe, including those parts of Russia in German hands, is a leading producer of any of these strategic minerals. Except for Asiatic Turkey, none ranks even as a major producer.

IRONFOUNDERS' NATIONAL CONFEDERATION

ANNUAL MEETING—CONCENTRATION SCHEME ABANDONED

Mr. V. Jobson presided over the annual meeting of the Ironfounders' National Confederation, which was held last Friday at Grosvenor House, when the annual report, which is summarised below, was submitted.

Membership.—Owing to the reorganisation of the industry through the C.F.A. and the consequent withdrawal from membership of the associated firms, the Confederation suffered a very considerable loss, and at the beginning of the year the prospects were none too bright. It is extremely gratifying therefore to be able to report an almost complete recovery in the membership position, which at the end of the year actually showed an increase of 64 per cent.

Subscription Levy.—The amount of the levy for 1942 was reduced by exactly one half. The Council was able to make this enormous reduction by effecting certain economies and by carrying forward a proportion of the subscriptions, which was passed back to the members in the lower subscription rate. The present circumstances do not permit of a similar arrangement this year, and, in addition, during 1943, the Confederation will be called upon to pay a very much larger contribution to the Council of Ironfoundry Associations consequent upon the establishment of a Fuel Committee and the appointment of a salaried Fuel Officer for the ironfounding industry.

The Council, however, does not propose to revert to the original levy. Although the present mode of taxation offers a specious justification for the undue increase of Association subscriptions, the policy of the Council remains as always—to keep subscriptions at the lowest possible rate. After careful consideration it has been decided therefore to fix the levy for the year 1943 at an intermediate rate during 1942, with a maximum subscription of £60.

Branch Associations and Committees

Branch Associations.—Local Branch Associations have now been set up in the East and West Ridings area with headquarters at Leeds, and in the North-Western area with headquarters at Manchester, and it is the intention of the Council to establish further Local Associations wherever there is a local demand. A Constitution for the government of these Local Associations has been agreed and satisfactory financial arrangements made for their working.

Technical Committee.—A Technical Committee has been set up by the C.F.A. and has already been able to render assistance to several of the members in the solution of their technical problems.

Fuel Committee.—In consultation with the Ministry of Fuel and Power, a Fuel Committee for the ironfounding industry has been appointed under the aegis of the British Cast Iron Research Association. A salaried fuel officer is in charge of the work of this Committee, the expenses of which are being met by the C.F.A. This additional expense accounts mainly for the increased contribution of the Confederation to the C.F.A. referred to above.

Concentration of Production

The outstanding event of the year was the unprecedented decision of the Board of Trade to impose concentration of production on the ironfounding industry. Early in the year representations were made to the Board of Trade that concentration of the ironfounding industry was not only impracticable but also was not in the national interest, and it was thought that the Board of Trade had then been brought to a realisation of the inherent difficulties. Later, however, the Board of Trade suddenly forced their concentration proposals on the industry without even consulting the existing Associations.

When it became obvious that the Board of Trade were adamant in their determination to carry through their proposals, the Council of Ironfoundry Associations decided to co-operate as far as possible. That did not mean a blind acceptance of the original proposals, which, on examination, proved to be based, in very many instances, on wrong information. Appropriate counter-proposals were made which ultimately received the approval of the Board of Trade and the principle was established that, for the future, the Board of Trade would act through the C.F.A. as representing the whole industry.

A Main Concentration Committee was formed and Local Concentration Committees to conduct the necessary preliminary investigations in each area; on all these committees the I.N.C. was adequately represented. Accountants were instructed to prepare a scheme for compensation for closed firms on a national basis. Progressively throughout the negotiations the Board of Trade became more and more aware of the difficulties inseparable from concentration of ironfounding production until, as a natural development, the C.F.A. were finally asked to initiate the proposals for the regions to be concentrated in the future.

In only two regions has concentration approached completion—the London and South-Eastern Region, where the approved scheme has been put into operation, and the Midland Region where a scheme has been approved but not yet applied. The results achieved in these two regions and the results anticipated from a preliminary survey of the other regions were such as to raise again the whole question of the expediency of endeavouring to concentrate the industry. The C.F.A., therefore, sought an interview with the Board of Trade. On the deputation which subsequently met the Parliamentary Private Secretary, Captain Waterhouse (in the unavoidable absence of the President, Mr. Hugh Dalton), the I.N.C. had 40 per cent. representation. The case submitted by the deputation was so carefully prepared, supported by such strong evidence and presented so skilfully, that the Board of Trade could not but admit its complete reasonableness, with the result that the Board of Trade have now agreed to abandon compulsory concentration of the ironfounding industry. This signal achievement was only made possible by the concerted and continued action of all the organisations in the industry.

(*Continued on page* 228.)

MOULDING SANDS AND MATERIALS

SECOND REPORT OF THE MOULDING MATERIALS SUB-COMMITTEE OF THE STEEL CASTINGS RESEARCH COMMITTEE

Section II.—Parts V, VI and VII: Thermal expansion and "insulating" sands. Section III.—Part I: Use of fuller's earth

(*Continued from page* 186)

PART V.—THERMAL EXPANSION OF SAND MIXTURES CONTAINING CLAYS

The expansion of sand mixtures on heating is a factor of some significance in steel-foundry practice, and it was decided to carry out experiments to discover whether there was any important difference in the rate of expansion on heating and the final expansion reached when sand mixtures were made up with different types of clay. The results of three such experiments are shown in Fig. 8. Mixtures were made or Arnold's 52 silica sand with additions of 7½ per cent. of bentonite, Colbond and ball clay, respectively. Thermal expansion test-pieces were moulded and all the specimens were dried at 200 deg. C. for 2 hrs.

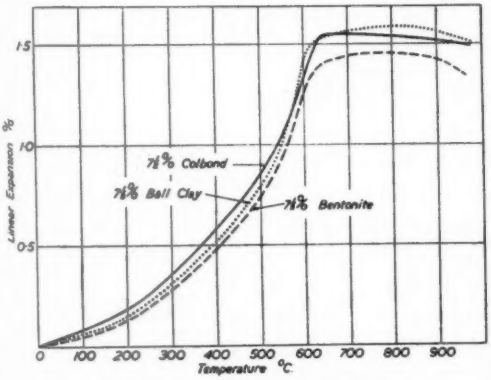


FIG. 8.—THERMAL EXPANSION CURVES FOR ARNOLD'S 52 SAND AND CLAY.

Thermal expansion tests were then carried out, the rate of heating in the range between 200 and 700 deg. C. being 2 deg. C. per min. in each case. The highest expansions recorded in each test were as follows: 7½ per cent. Colbond, 1.55 per cent.; 7½ per cent. ball clay, 1.59 per cent.; 7½ per cent. bentonite, 1.46 per cent. expansion.

Although the expansion of the mixtures containing Colbond and ball clay is somewhat greater than that of the mixture containing bentonite, the difference is not great, and it is doubtful whether differences of this order will have any significant effect on the behaviour of sands containing the different clays in actual use in the foundry.

PART VI—THE USE OF "INSULATING" SANDS

In the course of one of their investigations the Foundry Practice Sub-Committee discovered that improved feeding in certain types of head resulted from the use of a head lining with a low thermal conductivity, and asked for the examination of "insulating" mixtures to be carried out by the Moulding Materials Sub-Committee. Table VII gives the thermal conductivities of a number of the mixtures tried. It will be noticed that the mixtures with the lowest thermal conductivity are Nos. 5 and 6 containing sawdust, and this type of material, made up of a silica sand, sawdust and clay, was subsequently found by the Foundry Practice Sub-Committee to give the most satisfactory results when used for lining feeder-heads.

PART VII.—CONCLUSION AND RECOMMENDATIONS

It will be noticed that the sands examined occur in widely separated parts of Great Britain. It is suggested that, in view of present transport difficulties, which are always liable to increase considerably during the winter months, foundries should carry out trials more particularly of sands which occur reasonably near at hand.

The point must be emphasised that many naturally bonded sands do not yield their full strength on milling unless the rolls are sufficiently heavy and the time of milling is sufficiently long. The weight of the rolls should be the maximum which can be used without actually crushing the sand grains. The time of milling should be sufficiently long to distribute the clay uniformly over all the sand grains present, including those of the silica sand which is frequently used to dilute a heavily bonded natural sand.

The use in lining feeder-heads of mixtures with a low thermal conductivity is decidedly advantageous as far as feeding is concerned, but some care is necessary to ensure that this material, containing a large percentage of sawdust, does not become mixed with the ordinary backing sand when knock-out sand is being recovered for re-use.

SECTION III.—CLAYS

PART I.—THE USE OF FULLER'S EARTH IN STEELFOUNDRIES

During the years immediately preceding the present war, the manufacture of steel castings in green sand made rapid and considerable progress. A large part

Moulding Sands and Materials

of this expansion was associated with the use of synthetic sands, in which the mixtures for moulding were prepared from domestic silica sands and the natural clay bentonite, which was imported from the United States of America. Apart from an increase in the number of small repetition castings, there was an extension in the variety of types, and an increase in the maximum size and weight of castings made in green moulds. Other castings, in some cases of larger size, were made in skin-dried moulds, the sand mixture often consisting of silica sand and bentonite, with a small addition of an organic material, usually of the dextrin type. In some foundries, bentonite was regularly used as an additional clay in the facing sand for dry-sand moulds. Another, smaller, use of bentonite was as a constituent of mould paints.

The increasing popularity of bentonite in steel-foundries was due to a number of causes, the more important of which are briefly as follows. Bentonite is a highly plastic clay, and readily gives moulding mixtures which can be deeply moulded without cracking or breaking away. These mixtures are substantially free from the defect of drying-off and giving a friable surface, to which most similar mixtures containing domestic clays are prone. When a clay is heated to a sufficiently high temperature, it does not readily absorb water again on cooling. This permanent dehydration begins at a higher temperature for bentonite than for most domestic clays with a kaolin base. Probably associated with this is the fact that the foundry life of mixtures containing bentonite is long, that is, the sand knocked out of moulds after casting can be used again a considerable number of times with only a small amount of additional new clay each time the sand is re-used. The high green strength of bentonite mixtures means that adequate green strength for moulding can be secured with a small clay content, so that the permeability of the sand is not seriously reduced. Bentonite has an extremely small particle size, so that neither long nor heavy milling is required to give a thorough mixture with a sand and to secure the full bonding value of the clay used.

No.	Composition.	Hot Face. ° C.	Cold Face. ° C.	Air Temp. ° C.	Thickness. Cm.	Heat Loss. Cal. per sq. m. per hr.	Mean Temp. ° C.	Thermal Conductivity.	Estimated Porosity. %
1	Arnold 52 10% P.V.B. ball clay	880	182	25	7·5	2917	516	{0·00091 c.g.s. 2·64 B.Th.U.}	35–40
2	Arnold 52 25% resin 10% P.V.B. clay	Impossible to make brick satisfactorily. At a drying temperature of 100° C. the brick shrank badly and approached collapse.							...
3	Arnold 52 25% coke (−8, +22) 10% P.V.B. clay	510	117	20	7·6	1430	314	{0·00077 c.g.s. 2·23 B.Th.U.}	40–45
4	Arnold 52 50% coke (−8, +22) 10% P.V.B. clay	699	168	23	6·5	2600	433	{0·00088 c.g.s. 2·55 B.Th.U.}	35–40
5	Arnold 52 25% sawdust (−8, +22) 10% P.V.B. clay	432	78	19	7·6	750	260	{0·00046 c.g.s. 1·33 B.Th.U.}	65–70
6	Arnold 52 50% sawdust (−8, +22) 10% P.V.B. clay	430	78	20	4·5	745	279	{0·00023 c.g.s. 0·67 B.Th.U.}	70–80
7	Arnold 52 25% foamed slag (−8, +22) 10% P.V.B. clay	756	142	19	7·5	1918	449	{0·00065 c.g.s. 1·89 B.Th.U.}	45
8	Arnold 52 50% porous firebrick (−8, +22) 10% P.V.B. clay	669	144	23	7·3	1943	406	{0·00074 c.g.s. 2·2 B.Th.U.}	40–45
9	100% coke dust	941	272	24	4·5	6032	606	{0·0011 c.g.s. 3·19 B.Th.U.}	35–40
10	Crushed firebrick 15% P.V.B. clay	457	9	18	7·8	1020	275	{0·00061 c.g.s. 1·79 B.Th.U.}	45–50
11	Arnold 52 15% P.V.B. clay	603	120	10	7·69	1500	362	{0·00067 c.g.s. 1·94 B.Th.U.}	...

TABLE VII.—*Thermal Conductivities of Insulating Mixtures.*

The coke, sawdust, foamed slag and firebrick in Mixtures Nos. 3 to 8 were screened to pass a B.S.I. No. 8 sieve and remain on a No. 22 sieve. The firebrick in mixture No. 10 was screened to pass a B.S.I. No. 10 sieve and remain on a No. 16 sieve. The Arnold 52 sand was used as received, except in mixture No. 11, for which it was screened to pass a B.S.I. No. 12 sieve and remain on a No. 24 sieve.

Bentonite consists essentially of a montmorillonite mineral containing sodium, which is the active constituent, and α quartz, which is merely a diluent. No deposits of bentonite occur in Britain. Fuller's earth, of which substantial beds in this country have been worked for several hundred years, is, however, a comparable material, consisting substantially of a montmorillonite mineral containing calcium, with calcium carbonate as diluent. Most of the other British clays contain as their active constituent kaolinite, which is less efficient as a binder in green-sand/clay mixtures than montmorillonite. It is, however, considerably more refractory than minerals of the montmorillonite type.

Best Practical Bentonite Substitute

After exhaustive laboratory and foundry trials, it was found that, as far as green-sand moulding was concerned, fuller's earth offered the best practical substitute of domestic origin for imported bentonite, and the Sub-Committee invited the co-operation of the Fuller's Earth Union, Limited, in surveying the available resources of fuller's earth, in the production of fuller's earth in a form suitable for foundry use, and in carrying out experiments to increase its bonding efficiency by varying the methods of preparation. This co-operation was willingly given, and the members of the Sub-Committee are greatly indebted to Mr. R. H. S. Robertson for his valuable assistance in this connection. It was decided that the Fullers' Earth Union, Limited, should supply these fuller's earths to foundries under the name of Fulbond, several varieties of which are now available.

The initial trials were carried out with Fulbond No. 1, a natural fuller's earth dried and ground under controlled conditions, and with Fulbond No. 2, for which the method of preparation was modified to obtain greater strength. The structures of Wyoming bentonite, Fulbond No. 1 and other materials for comparison were studied by X-ray photographs. The method of preparing Fulbond No. 2 was subsequently modified further, and as a result Fulbond No. 3 is now regularly supplied to foundries where its special properties are found to be of value. Fulbond No. 1*A*, like Fulbond No. 1, is a natural fuller's earth prepared and ground without subsequent treatment, but is not obtained from the same deposits as Fulbond No. 1. The kinds of Fulbond now available commercially are thus Nos. 1, 1*A*, 2 and 3.

Fulbond No. 1 has been found suitable for most steelfoundries. In green-sand mixtures its bonding efficiency is 70 to 80 per cent. of that of average Wyoming bentonite, so that in changing from a synthetic sand mixture containing 3 per cent. of bentonite, from 4 to 5 per cent. of Fulbond No. 1 is required instead. The introduction of this greater percentage of clay naturally decreases to some extent the permeability of the sand mixture. This reduction is usually not important, but if in a particular case the permeability is reduced to too low a figure, the addition of a coarse silica sand, such as Arnold 52 or Leighton Buzzard No. 9, will increase the permeability to the desired figure. If a sand-reclamation system is in operation, it is to be remembered that an additional weight of clay is being carried in the system.

To obtain the full bonding power from Fulbond No. 1, heavier milling and frequently longer milling times are required than with bentonite. Good plastic mixtures which will admit of deep moulding are obtained in this way, and they do not dry off unduly. The foundry life of Fulbond No. 1 in repeated use is comparable with that of bentonite, but slightly shorter. The refractoriness of Fulbond No. 1 is lower than that of bentonite, but the stripping properties of similar mixtures containing each clay are very similar.

Dry Strength of Mixtures

The dry strength of sand mixtures containing Fulbond No. 1 is substantially lower than that of similar mixtures containing the same percentage of bentonite, dried under the same conditions. This difference still exists, but is very greatly reduced, when the percentage of Fulbond No. 1 is increased until the Fulbond mixtures have the same green strength as the bentonite mixtures. The manufacture of medium-sized steel castings in skin-dried moulds was increasing at the outbreak of war, and for this purpose mixtures containing bentonite had become popular. This method of making steel castings is probably of greater importance under present conditions, since the only practicable way of avoiding it is by the installation of additional drying stoves, for which there is usually little space available. For this purpose mixtures of silica sand and Fulbond No. 1 alone have not proved entirely satisfactory. The addition to such mixtures of an organic material, such as a small amount of dextrin or G. B. Kordek, is of great practical advantage, and gives satisfactory results in nearly all cases. It is generally unnecessary for the organic addition to exceed 1 per cent. of the weight of the mixture.

For the manufacture of dry-sand steel castings, naturally bonded sands have always been much more widely used than silica-sand/bentonite mixtures, and mixtures of silica sand with fuller's earth are similarly of relatively minor importance. During the present emergency it has been necessary to extend the use in steel foundries of clays of British origin. Many of these, when used in proportions which give mixtures with adequate dry strength, do not provide sufficient green strength, and in some cases give mixtures which are not sufficiently plastic to mould deeply without cracking or breaking. In such sand mixtures, the addition of Fulbond No. 1 in proportions up to 20 per cent. of the total clay content improves the mixtures considerably in both respects and enables satisfactory moulds to be made.

Fulbond No. 1A, like Fulbond No. 1, is a naturally occurring fuller's earth, dried and ground under controlled conditions, but not specially treated in any other way. In properties it is generally similar to Fulbond No. 1, but develops slightly less strength.

Fulbond No. 3 is a fuller's earth which has been treated chemically in order to increase the green strength of mixtures containing it. When milled with

Moulding Sands and Materials

silica sand it develops its maximum green strength more quickly than Fulbond No. 1, and permits of a reduction in the weight of the rollers or of the milling time. The variation of green strength with the moisture content of the mixture is more rapid with Fulbond No. 1 than with bentonite. Similar mixtures containing Fulbond No. 3 are considerably less sensitive to variations in water content, and in this respect Fulbond No. 3 approaches bentonite in its properties.

A comparison of the green strengths of mixtures made in the laboratory by milling a coarse-grained silica sand with the same proportion of Fulbond No. 1 and Fulbond No. 3 is given in Table VIII. This shows the superior green strength of the Fulbond No. 3 mixtures, also that this green strength falls off

TABLE VIII.—*Arnold's 52 Silica Sand with 5 per cent. of Fulbond No. 1 and with 5 per cent. of Fulbond No. 3.*

Test cylinders 2 in. × 2 in. rammed in A.F.A. apparatus; number of blows, 10. Specimens dried at 200 deg. C. for 2 hours.

Water content. Per cent.	*A.*—5 per cent. of Fulbond No. 1.		*B.*—5 per cent. of Fulbond No. 3.	
	Green strength. Lb. per sq. in.	Dry strength. Lb. per sq. in.	Green strength. Lb. per sq. in.	Dry strength. Lb. per sq. in.
1.25	8.4	—	11.45	15.9
1.50	8.0	12.7	10.20	21.0
1.75	7.0	17.5	8.95	21.6
2.00	6.6	18.7	8.75	23.2
2.50	5.9	22.0	7.95	27.6
3.00	5.25	25.2	7.47	33.0
3.50	4.15	32.8	7.25	41.0
4.00	3.26	38.9	7.16	47.0

with increasing water content more slowly than that of the Fulbond No. 1 mixtures, and, further, that the dry strength of the Fulbond No. 3 mixtures is greater than that of the corresponding Fulbond No. 1 mixtures. The extra chemical treatment given to Fulbond No. 3 makes its price higher than that of Fulbond No. 1. It has been found in practice that Fulbond No. 1 gives quite satisfactory results, and there is no need to obtain the more expensive Fulbond No. 3, except in cases where its special properties can be advantageously employed.

The properties of mixtures made from a silica sand of medium grain size with 3, 4 and 5 per cent. of bentonite, Fulbond No. 1 and Fulbond No. 3 are given in Table IX. The results in Tables VIII and IX must be regarded as typical and of comparative value only, since the sands and clays used are natural products, subject to some variation in properties in different parts of the deposits from which they are derived.

A number of steel foundries paint moulds with a creamy liquid, consisting essentially of silica flour suspended in water, thickened by the addition of sulphite lye, core cream or other organic material. The addition of bentonite to these liquid paints gave improved results, since the bentonite helped to keep the silica flour in suspension, and also assisted in hardening the paint on drying. For this purpose bentonite may be replaced by either Fulbond No. 1, No. 2 or No. 3. In such paints Fulbond No. 2 is most effective, and No. 3 is better than No. 1, but if a foundry uses Fulbond No. 1 for other purposes, it is scarcely worth

TABLE IX.—*Chelford Silica Sand with Bentonite and with Fulbond.*

Test cylinders 2in. × 2 in. rammed in A.F.A. apparatus; number of blows, 10. Samples dried at 230 deg. C. for 2½ hours.

Clay addition.	Permeability No.	Water content. Per cent.	Green strength. Lb. per sq. in.	Dry strength. Lb. per sq. in.
Bentonite—				
3 per cent. ..	119	3.5	5.5	55
3 „ ..	99	5.0	5.0	85
4 „ ..	105	3.6	6.6	65
4 „ ..	99	5.0	6.1	100
5 „ ..	93	3.5	8.6	100
5 „ ..	88	5.1	7.5	115
Fulbond No. 1—				
3 per cent. ..	119	3.5	2.7	33
3 „ ..	99	5.2	1.6	52
4 „ ..	105	3.6	4.5	55
4 „ ..	99	5.0	2.8	61
5 „ ..	105	3.6	6.6	65
5 „ ..	93	5.2	4.3	96
Fulbond No. 3—				
3 per cent. ..	115	3.6	3.9	43
3 „ ..	105	5.2	3.1	61
4 „ ..	108	3.6	5.3	54
4 „ ..	99	5.2	4.0	80
5 „ ..	105	3.5	7.3	90
5 „ ..	93	5.2	5.5	105

while obtaining a supply of Fulbond No. 2 or No. 3 merely for making up paints.

Another material of the fuller's earth class is marketed under the name "A.C.33." The properties of sand mixtures made with Chelford silica sand and different percentages of A.C.33 are shown in Table X. Comparing these with the results in the previous tables, the binding properties of A.C.33 are superior to those of Fulbond No. 1 and are very close to those of Fulbond No. 3. Like Fulbond No. 3, A.C.33 has a longer range of useful moisture content than Fulbond No. 1. Table XI gives the properties of sand mixtures prepared in a foundry pan-mill, using as the base sand a mixture containing 25 per

cent. of Yorkshire moulding sand with 75 per cent. of Chelford silica sand, the additional binders being bentonite, Fulbond No. 1, Fulbond No. 3 and A.C.33. The properties of the resultant mixtures are all very similar, and all were used for making the same type of green-sand casting. All the mixtures moulded well and the moulds had a good surface, although the mixture containing A.C.33 was a trifle sticky and had a tendency to ram to a joint. All the castings stripped well and there was no significant difference between their surfaces.

Samples of other clays of the fuller's earth group

TABLE X.—*Chelford Silica Sand with* A.C.33.

Test cylinders 2 in. × 2 in. rammed in A.F.A. apparatus; number of blows, 10. Samples dried at 230 deg. C. for 2½ hours.

Clay addition. Per cent.	Permeability No.	Water content. Per cent.	Green strength. Lb. per sq. in.	Dry strength. Lb. per sq. in.
3	112	3.4	4.0	42
3	102	5.25	2.5	52
4	112	3.5	4.6	47
4	93	5.1	3.6	77
5	102	3.4	7.1	55
5	96	5.2	5.1	83

are being examined by members of the Sub-Committee, and, where the results of laboratory investigations are sufficiently promising, foundry trials will be arranged.

Conclusion and Recommendations

The clays of domestic origin which have properties nearest to those of bentonite are of the fuller's earth type, and a large number of steelfoundries formerly using bentonite are now using fuller's earth instead with good results. In most cases Fulbond No. 1 has proved satisfactory. Less satisfactory results are often due to the use of insufficiently heavy mills or to an inadequate time of milling. If heavier or longer milling cannot be carried out, it is advisable to use Fulbond No. 2 or No. 3 instead of Fulbond No. 1. Where very high dry strengths are required, some of the leaner domestic clays can be used with advantage, the necessary green strength being obtained by an addition of Fulbond No. 1. Particular examples of this are given in a later section of this Report.

One point to be remembered is that the foundry life of fuller's earth appears to be slightly less than that of bentonite. As, in any case, the clay content of mixtures using fuller's earth is higher than that of mixtures with similar strengths containing bentonite, it is very advisable to make sure, if recovery or reclamation of moulding sand is being carried out, that a sufficiently high proportion of old clay or old sand is removed and new clay added. Neglect of this precaution may lead to trouble in stripping or other defects on the surface of the castings.

(*To be continued.*)

TABLE XI.—*Sand Mixtures used in the Foundry.*

Base sand: Yorkshire, 25 per cent.; Chelford, 75 per cent. Test cylinders 2 in. × 2 in. rammed in A.F.A. apparatus; number of blows, 10. Samples dried at 230 deg. C. for 2½ hours.

Clay addition.	Permeability No.	Water. Per cent.	Green strength. Lb. per sq. in.	Dry strength. Lb. per sq. in.
Bentonite, 3 per cent. ..	77	3.75	13	100
Fulbond No. 1, 5 per cent. ..	65	4.0	14	115
Fulbond No. 3, 4 per cent. ..	73	3.9	11	90
A.C.33, 4 per cent. ..	65	4.2	10	110

BOOK REVIEW

The Mechanical Working of Steel, by Edwin Gregory and Eric N. Simons. Published by Sir Isaac Pitman & Sons, Limited, Parker Street, Kingsway, London, W.C.2. Price 10s. 6d.

It is doubtful whether, until the publication of this book, there existed a work of reference which gave a properly balanced description of all the various processes used for converting steel ingots into semi-finished material and articles of commerce. It has no pretensions to being an advanced treatise on the subject, and those seeking such information as the functioning of the latest type of continuous mills must look elsewhere. Yet, unless they were in possession of the knowledge disclosed in this book, they would find the task difficult. The subjects covered include some which are to be more generally identified with the Sheffield trades, and outstanding in this category are cold drawing and rolling. The book opens with a chapter on forging, which is followed by others on drop and machine forging. To each of the subjects of hot- and cold-rolling and pressing a chapter is devoted. Thread rolling is a subject which is of considerable technical interest to foundrymen. In describing the process the authors have been fortunate in being able to draw upon some original work carried out by Dr. Jevons. Knurling and radial expansion are other phases of mechanical work about which little is known in technical circles, and, towards the end of the book, each is accorded a chapter. Foundry executives desiring to obtain a working knowledge of processes which are often competitive to their own will find the reading of this book an easy and reliable method of acquiring it, for simple straightforward English has been used throughout its compilation.

V. C. F.

MORE AND STILL MORE PAPER WANTED!

IRONFOUNDERS' NATIONAL CONFEDERATION

(*Continued from page* 222.)

Although the immediate threat of concentration has been removed from the industry, it will be necessary for the future to redouble efforts and maintain an unceasing vigilance. The wartime powers of the various Ministries are so comprehensive that there is little they cannot now accomplish by means of a simple Order. The industry therefore must always be in a state of immediate preparedness, on every occasion, to mobilise its maximum strength to further the prosecution of the war and, at the same time, to take appropriate action where a governmental direction seems redundant, oppressive or contrary to the national interest.

Other Activities

It would be difficult to enumerate the many and various subjects which have come before the Council in the course of the year, and it may be sufficient meantime to mention such questions as standardised costing, absenteeism, price control, supplementary clothing coupons, railway rates, etc. The Council feels that members, as a whole, do not avail themselves sufficiently of the services of the Confederation and would welcome more frequent inquiries and suggestions from individual firms on subjects affecting both their own problems and the general welfare of the industry.

Chairman's Speech

Amplifying the report, the chairman said he did not want it thought that because differences existed and that ironfounders had been able, as a partially organised industry, to force modifications in the Government's programmes, the work was done. This criticism of the Government's proposals did not show any weakening in the determination to carry on with all resources and vigour. On the contrary, these criticisms were essentially a demand for even more forceful action and the position now was that the I.N.C. disregarded purely selfish and personal aims and attempted to show the Board of Trade how much the members could do through voluntary concentration. The machinery was available through the already established Trade Associations and the Local Concentration Committees of the C.F.A., and it was up to members to examine the conditions in each and every locality and endeavour to increase production and effect economies by whatever means. It was unavoidable that some firms would fall by the wayside, but in the aggregate and under the assurance of the Board of Trade that they would countenance and approve schemes for voluntary concentration and issue the necessary certificates for the protection of the nucleus and the closed firms, it would be possible to make perfectly fair adjustments. It was a duty to themselves and first and foremost a duty to the country and one which he felt sure would be wholeheartedly undertaken.

Organisation of the Founding Industry

He failed to see why ultimately the industry should not aim to include under some central overriding body all metal founders; that was to say, steelfounders, the malleable industry, the brass, bronze and light alloy founders, as well as the suppliers of raw materials, it being understood that a founder is a founder whether he produces castings for sale as such or for further processing in his own works. This idea may appear on the surface to be Utopian, but it must be remembered that the tonnage of production of the ironfounders of this country greatly exceeds the tonnage production of the other industries mentioned, and therefore the ironfounders are in a position to give a lead.

Cost Accounting

Apart altogether from the petty annoyances which are created by the operations of ironfounders who have no real conception of the cost of their products, it was essential to save those ironfounders from themselves, and it was their duty as an organised industry to evolve a system of costing which was applicable to the whole industry. Obviously there was a bewildering variety of divergent products and divergent methods in the industry, but surely it was not beyond their wit to find common denominators by which various types of castings could be measured and classified. This visualised in the long run some sort of a price schedule, and to achieve such a consummation would be a very long, arduous and complicated task. There was no immediate prospect of that and therefore in the meantime some simple system of costing which would be universally acceptable must be devised. In the fulness of time, a later generation perhaps may be able to solve the gigantic jigsaw puzzle presented by the ironfounding industry, but it was up to the industry to make a beginning now while everybody was united by a sense of common peril and by a common determination.

Finally, he acknowledged very cordially the support given to him by his colleagues on the Council and by the members and staff of the Confederation.

NEW TRADE MARKS

The following applications to register trade marks appear in the "Trade Marks Journal":—

"NUCLOTEX"—Textile machinery. GEORGE CLAPPERTON, Springfield, Green Lane, Bolton, Lancs.

"ASEA"—Electrical cables and wires, etc. ASEA ELECTRIC, LIMITED, Fulbourne Road, Walthamstow, London, E.17.

"HELVETEX" — Machine belting. HELVETIA LEATHER COMPANY, LIMITED, 258, Langham Road, London, N.15.

"VETA"—Machine belt fasteners of metal. HELVETIA LEATHER COMPANY, LIMITED, 258, Langham Road, London, N.15.

"ULTREX"—Reamers (hand tools), and chucks. B. ELLIOTT & COMPANY, LIMITED, Victoria Road, Willesden, London, N.W.10.

STANTON *Dale* REFINED PIG IRON

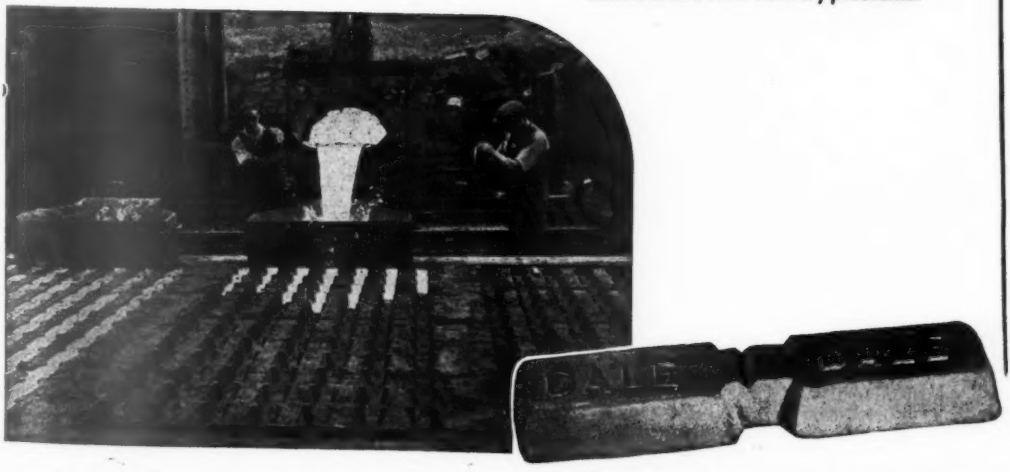
IS CHARACTERISED by closeness of grain structure, uniformity of composition and fine graphitic carbon evenly distributed.

IS PRODUCED to guaranteed analysis in seven standard grades.

CAN BE MADE to customers' individual requirements with total carbon from 2·6 per cent. upwards.

SHOULD BE USED to tone up high phosphorus irons and scrap, to replace Hematite, and to produce castings for all high duty purposes.

Users are invited to avail themselves of the Stanton Technical Service which offers free expert advice on special mixtures and other Foundry problems.



THE STANTON IRONWORKS COMPANY LIMITED, NEAR NOTTINGHAM

IRON FIREBRICK SALES

Hattersley Bros., Limited, Queen's Foundry, Swinton, were fined £5 5s., with £5 5s. costs, on each of seven summonses for breaches of the Control of Iron and Steel (No. 15) Order and the Defence Regulations at Rotherham last week.

Mr. G. G. Beagley, prosecuting, said defendants manufactured iron castings which served the purpose of firebricks. They were entitled to sell up to £10 worth in any month to any one person. In all in the period covered by the summonses they had sold £164 worth against a total of £20 worth which they were entitled to sell. The castings had been sold to a company which in turn sold them to a firm of multiple stores. It was not suggested there was anything in the nature of black marketing. All the transactions were carried out quite openly.

Mr. J. McLusky, defending, said it was no more than an inadvertent excess of quota. The firm had a licence entitling them to acquire all the iron and steel which had gone into the making of the bricks, but at the time the bricks were disposed of, it was not appreciated that the firm was prevented from selling more than restricted quantities. He suggested that no harm had been done to the national cause, because the castings had gone into people's homes to be used as coal savers.

The Chairman said the Bench believed the offences had not been committed with intent to harm the national effort, and regarded them more in the light of technical offences.

WAGES IN ENGINEERING

The conference on the application of the unions for an advance in wages in the engineering industry was resumed in London last week between representatives of the Engineering and Allied Employers' National Federation and the National Engineering Joint Trades Movement. The parties failed to agree. The unions intimated that they would report the position to the Ministry of Labour with a view to reference to the National Arbitration Tribunal. The Tribunal is to hear the claim to-day (Thursday). The unions' application, presented at a conference with the employers last November was for: (1) The raising of the basic rates by 11s.; (2) an addition of 33⅓ per cent. on basic rates to all plain timeworkers; and (3) the full restoration of the pre-1931 conditions. The employers replied in January with an offer, which was referred to a joint sub-committee for consideration. In the course of the discussions, the unions presented counter-proposals, but when the full conference was resumed on February 19 it was found that these were unacceptable to the employers, and the conference was adjourned to enable the union representatives to consult their executive councils. Last week's failure to reach a settlement was the sequel. It is understood that the employers offered an increase of 6s. a week to all skilled plain timeworkers.

OBITUARY

MR. RODNEY WINTERTON, younger son of Mr. H. Winterton, a past-president of the Institute of British Foundrymen, died recently on active service. He was aged about 32.

MR. FREDERICK GEORGE SMITH, a director of the Wellman Smith Owen Engineering Corporation, Limited, died recently at his home at Purley, Surrey. Mr. Smith had been associated with the Wellman companies for over 30 years and was a director and technical manager of the present Wellman Corporation from its formation.

MR. H. W. RENNIE died recently at the age of 76. Trained as a metallurgical chemist, he went to Malaya and was assayer of metals to the Pahang Corporation. Afterwards, he joined James Rennie & Company, metal merchants, of Birmingham, in which firm he became a partner. He retired from business about two years ago. He was awarded the C.B.E. in 1920.

PROF. JOHN EUSTICE, who died recently, trained as a mechanical and metallurgical engineer. He was Whitworth scholar in 1887 and national science scholar in 1888. From 1892 to 1931 Prof. Eustice was head of the engineering department of University College, Southampton, and after 1931 was Professor Emeritus. For a time he was technical director of the Austin Motor Company, Birmingham.

MR. ROLLO APPLEYARD, the distinguished physicist and submarine cable engineer, died recently. Born in 1867, he took part in experiments with early forms of arc lamps, dynamos, and motors. He later engaged in original research on various physical questions, including the contact resistance of dialectrics, coherers, the conductivity of copper, the deterioration of certain alloys used for electrical purposes, surface tension, and platinum thermometry.

GUIDE TO RAW MATERIALS

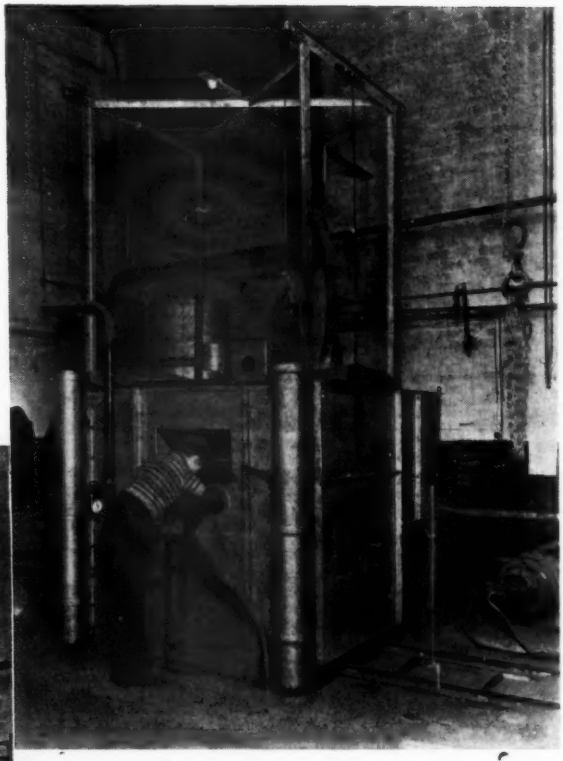
The Ministry of Supply has just issued the "Raw Materials Guide" with a view to assisting business men, traders and all others interested who may in the past have experienced difficulty in keeping track of the regulations relating to specific raw materials. Since the outbreak of war innumerable statutory rules and orders have been issued and it has been extremely difficult even for those in daily contact with, for example, the iron and steel trade, to keep fully conversant with the current position as laid down by the controlling body. The "Raw Materials Guide" in 75 pages deals with nearly 1,000 different raw materials.

Foundrymen will find that their interests are fully covered in the iron and steel and non-ferrous metals sections, which give full details of the various Control Orders, methods of procedure, addresses of the controlling bodies, etc.

It is proposed to issue monthly addenda of any changes in controls or in procedure, in order to keep the Guide completely up to date. The Guide is issued by H.M. Stationery Office, York House, Kingsway, London, W.C.2, price 1s. net.

Shot Blast Plant

by SPENSTEAD



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NEWS IN BRIEF

A MEETING of Lancashire Dynamo & Crypto, Limited, has been convened for March 31 to consider a resolution that the capital of the company be increased to £660,000 by the creation of 200,000 additional ordinary shares of £1 each.

IN ADDITION to 'planes, tanks, and guns, America has shipped to the Soviet Union more than 580,000 tons of steel, 46,000 tons of aluminium and duraluminium, 21,500 tons of zinc, 94,000 tons of copper, brass and nickel, and 75,000 tons of rails and 17,000 tons of other railway equipment.

THE ANNUAL MEETING of the Brassfounders' Employers' Association was held last week. The report shows the membership to have increased by 64 to 151, and that a branch has been formed in London. During the year a confidential document dealing with wages and conditions has been issued to members and has been warmly received.

SUBJECT TO THE EXIGENCIES of the war the Government are advising industry that for the maintenance of health and efficiency the usual summer holidays should be taken this year, providing they do not last longer than a week, and that the Saturdays before each of the bank holidays at Easter, Whitsuntide, and August should also be approved holidays as well as the Monday after Christmas Day, which this year will fall on a Saturday.

A MEETING of the Manchester Association of Engineers is to be held at the Engineers' Club, Albert Square, Manchester, at 2.30 p.m., on March 27, when there will be an open discussion on "Substitute Materials." The discussion will be opened by Mr. G. E. Windeler, past-president of the Association, who will discuss a number of instances where alternative materials have had to be found for certain engineering applications in view of the wartime supply position of raw materials.

MR. ERNEST BROWN, Minister of Health, addressing a meeting of London and the Home Counties local authorities, said that after the war we might have to aim at a target figure of between three and four million new houses. It took 20 years to build 4,000,000 houses after the last war. This time we must build at twice the rate. He asked local authorities to decide on sufficient sites for a one-year housing programme, to buy the land and go ahead with the preliminary work of surveying and preparing the general layout.

THE TOWELS RATION for factories between now and December 31 will be at the rate of four coupons for every ten manual workers employed for more than 22 hours per week, plus an additional four coupons for every ten such workers in special classes, which include workers under special regulations or welfare orders requiring washing accommodation in brass casting and vitreous enamelling establishments. Applications may be made by the factory occupiers only, who should write to their District Inspector of Factories asking for form M.L.2050.

PERSONAL

MR. JOHN HOWE HALL, the well-known metallurgist, has joined the staff of General Steel Castings Corporation, Eddystone, Pa.

MR. GEORGE CLARK, chairman of the Bryan Donkin Company, Limited, Chesterfield, has completed 50 years' service with the company.

MR. E. P. PAXMAN has been elected a director of Ruston & Hornsby, Limited. He is managing director of Davey Paxman & Company, which became a subsidiary company of Ruston & Hornsby early in 1940.

SIR MAURICE E. DENNY, head of William Denny & Bros., Limited, shipbuilders and engineers, of Dumbarton, has been elected honorary president of the British Corporation Register of Shipping and Aircraft.

MR. N. L. GOODCHILD, Director for Pig-iron, has also been appointed Director for Electrodes. Mr. Goodchild joined the Iron and Steel Control immediately on the outbreak of war from the Stanton Ironworks Company, Limited.

MR. AND MRS. JOHN MATHIESON, of North Gosforth, Newcastle, celebrated their golden wedding on March 8. Mr. Mathieson is chief sales manager for the Consett Iron Company, Limited. He has been with the company for more than 50 years.

MR. ROBERT A. MACGREGOR, formerly of Darlington, who for many years was chief metallurgist at the Darlington Forge, Limited, until going to India about eight years ago, has been appointed a Companion of the Order of the Indian Empire in recognition of his work as chief metallurgist at the Department of Supply, Calcutta.

MR. H. SMIBERT, resident manager at Sunderland of the North-Eastern Marine Engineering Company, Limited, has been transferred to the firm's Wallsend works in a similar capacity. Mr. W. Hoy, manager of J. Dickinson & Sons, Limited, engineers, Sunderland, has been appointed to succeed Mr. Smibert, while Mr. A. Schaeffer, of Wallsend, succeeds Mr. Hoy.

MR. FRANCIS W. ROWE, B.Sc., is to join the board of Kryn & Lahy (1928), Limited, engineers, steelfounders, etc., of Letchworth, as managing director on April 1. Mr. Rowe, until recently, was on the board of David Brown & Sons (Huddersfield), Limited, and was general manager of their Penistone Works. He is a prominent member of the Institute of British Foundrymen and is well known to engineers and foundrymen. Mr. Rowe has been the recipient of many honours for his work in the field of engineering and metallurgy. He has been with David Brown & Sons (Huddersfield), Limited, for nearly 20 years, and has been associated with many of the developments, especially the Randupson process, for which that company is famous.

Wills

PRIESTLEY, BENJAMIN, of Sheffield, builders and ornamental ironwork manufacturer	£1,637
ALLEN, SAMUEL, of Glasgow, for many years with William Beardmore & Company, Limited ...	£14,943
TURNER, ARTHUR, of Stirling, district engineer, of the British Thomson-Houston Company, Limited	£7,999

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The advantages of insulation include :—

- **Conservation of Fuel.**
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Efficient insulation can permit greater output — lower production costs — improved furnace control and better operating conditions.

THE production and importation of fuel is a grim business. "Austerity" demands the utmost economy in its use in all industrial furnaces and heat-generating plants. Avoidable heat losses must be stopped. This implies that wherever insulation is applicable, an efficient system should be installed as quickly as possible. General Refractories' "Amberlite" range covers the requirements of every industry and large quantities of materials are available from stock. G.R. insulation specialists are always ready to assist users in the choice of materials to meet particular conditions of service.

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G.P.159

COMPANY NEWS

(Figures for previous year in brackets.)

Peter Brotherhood—Interim dividend of 8% (same).

Switchgear & Cowans—Dividend for 1942 of 20% (10%).

R. & W. Hawthorn Leslie—Interim dividend of 3% (same).

Gandy Belt Manufacturing—Ordinary dividend of 6% (same).

Crabtree Electrical Industries—Interim dividend of 5% (same).

John C. Parkes & Sons—Final dividend of 6⅓%, making 10% (same).

Guest Keen Baldwins Iron & Steel Company—Ordinary dividend of 5% (same).

Ingall, Parsons, Clive—Net profit for the year ending September 30, 1942, of £9,388.

Neepsend Steel & Tool Corporation—Interim dividend on the ordinary capital of 15% (same).

Hoffmann Manufacturing—Final dividend of 10% on the ordinary shares, making 17½%, tax free (same) for 1942.

Taylor Tunnicliff (Electrical Industries)—Final ordinary dividend of 12½% (10%), making 15% (12½%) for 1942.

Engineering Components—Net profit for 1942, £20,533 (£19,553); ordinary dividend of 25% (same); forward, £12,276 (£9,618).

Thomas Robinson & Son—Profit for 1942, £30,934 (£29,396); dividend on the preference capital, £11,250; ordinary dividend of 7½% (same); forward, £37,632 (£34,567).

Midland Electric Manufacturing—Profit for 1942, after tax, £44,606 (£42,022); dividend on the ordinary shares of 10% (same), together with a cash bonus of 15% (same).

Webley & Scott—Net profit for 1942, after tax, £34,639 (£37,367); dividend of 15% (same), with bonus of 10% (same); to war contingencies reserve, £10,000 (£4,630); to general reserve, nil (£5,000); forward, £20,867 (£15,072).

British Thomson-Houston—Profit for 1942, after tax provision, £562,883 (£559,776); to depreciation, £224,950 (£229,667); to general reserve, £100,000 (same); ordinary dividend of 7% (same); forward, £254,171 (£217,413).

Redpath Brown—Net profit for the year ended July 31, 1942, after providing for depreciation, taxation, etc., £47,688 (£68,851); ordinary dividend of approximately 12½% (18%), tax free, amounting to £42,438 (£63,404); forward, £172,244 (same).

Power Securities Corporation—Gross profit for 1942, £118,492; balance, after providing for all expenses, including income-tax, £50,664; preference dividend, £17,500; dividend on the ordinary shares of 6%, £24,000; forward, £38,403 (£29,239).

Beans Industries—Net profit for the year to November 30, 1942, after taxation, £40,052 (£42,086); war damage insurance, £2,933 (£8,833); ordinary dividend of 37½% (same); to general reserve, £10,000 (nil); to contingencies reserve, £5,000; forward, £17,109 (£16,490).

Spencer (Melksham)—Trading profit, after taxation, for the year to September 30, 1942, £28,667 (£24,133); net profit, £12,108 (£7,861), after interest, fees, depreciation and sinking fund; ordinary dividend of 10% (same); employees' co-partnership, £735 (£612); forward, £20,084 (£15,593).

Dorman Long—Net profit for 1941-42, after taxation, debenture interest and sinking funds, £805,830 (£509,208); depreciation, £275,000 (same); to reserve covering contributions and premiums paid under the War Damage Act, £65,000 (£100,000); to pension fund, £15,000 (nil); dividends of 16% (nil) on the preferred shares and 8% (nil) on the ordinary shares; forward, £55,746 (£52,231).

Bruce Peebles—Profit for 1942, after making provision for taxation and tax and E.P.T., war damage insurance, £39,565 (£32,987); to depreciation reserve, £19,000 (£13,000); dividend on the preference stock of 7½% and a further dividend of 2½%, contingent on profits, making 10% (same), £5,107; ordinary dividend of 5% and a bonus of 3%, making 8% (same), £14,222; forward, £12,000 (£10,764).

TRANSPORT OF HOME-PRODUCED SCRAP

The Minister of Transport has made a Direction regularising from the railway standpoint the permit-label system for scrap instituted by the Iron and Steel Control a few months ago. Made under the Defence Regulations, and entitled "The Transport of Home-Produced Scrap Iron and Scrap Steel Direction, 1943," it provides that,

"In any case in which a Railway Company has entered into arrangements, either direct or through the Ministry of Supply, with a firm for regulating, by means of permit labels issued by that firm, the conveyance by rail of home-produced scrap iron or scrap steel consigned to that firm, such consignments shall not be accepted for conveyance by the Railway Company without the permit label."

The Direction does not apply to consignments for conveyance partly by rail and partly by sea. It came into force on March 1.

CONTRACTS OPEN

The date given is the latest on which tenders will be accepted. The address is that from which forms of tender may be obtained.

Belfast, March 23—Fishplates, springs, etc., for the Town Council. The Acting General Manager, Transport Department, Sandy Row, Belfast.

Shrewsbury, March 23—Limestone, furnace slag, iron castings, etc., for the year ending March 31, 1944, for the Salop County Council. The County Surveyor, County Buildings, Shrewsbury.

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DIAMOND IRON CEMENT

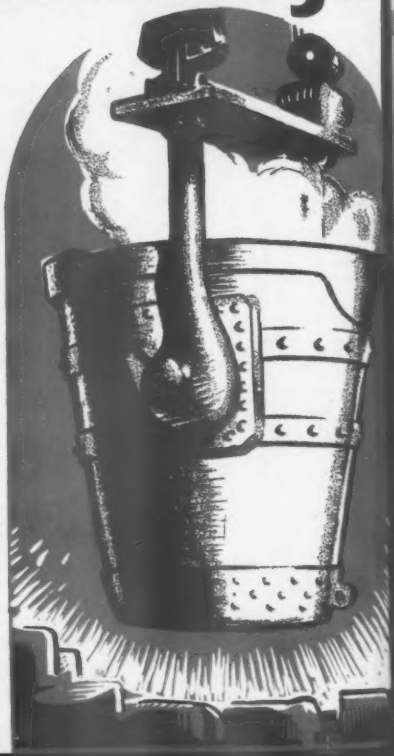
SETS iron hard in 48 hours. Withstands high temperatures and pressures and is machinable. Indispensable to Founders, Boiler-Makers, etc., for filling blow-holes, badly fitting joints and smoothing over rough patches. Unites perfectly with the metal and expands in drying to form a perfect joint.

1/8 per lb.nett, in 20 lb.tins. Carriage paid. This *includes* special liquid for mixing.

UNIVERSAL IRON CEMENT

A powder which mixes with water into a thick paste For smoothing into holes, bursts or porous places. Sets rapidly and is as hard as iron in 12-24 hours. Perfect bonding with the metal. An ideal medium for making good the defects which may occur in casting.

1/- per lb. nett. Carriage paid on 28 lb. tins.



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